RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603726F C3 Subsystem Integration

	COST *($ In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
	Total Program Element (PE) Cost	7,591	10,993	9,122	4,920	5,852	6,752	6,893	7,036	Continuing	Continuing
2810	Advanced Image/Information/Optical Memory Technology Applications	3,890	5,832	3,562	4,920	5,852	6,752	6,893	7,036	Continuing	Continuing
2863	Integrated Photonics	3,701	5,161	5,560	0	0	0	0	0	0	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1998, Project 2810, Advanced Image/Information Applications, and Project 3192, Advanced Optical Memory Technology, were combined into Project 2810, Advanced Image/Information/Optical Memory Technology Applications. In FY 2001, the efforts in Project 2863, Integrated Photonics, will be conducted in Project 69CK, PE 0603203F.

(U) A. Mission Description: This Advanced Technology Development program develops and demonstrates Command, Control, and Communications (C3) technologies in the areas of processing and fusion of digital databases, photonics technology, optical disk storage/processing of digital information, and distributed processing technology for interoperability between dispersed command centers. These technologies provide increased storage, processing, and transmission of digital data received from a broad variety of sensors and sources.

(U) B. Budget Activity Justification: This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new system developments that have a military utility and address warfighter needs.

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(U) **C. Program Change Summary ($ in Thousands):**

	FY 1998	FY 1999	FY 2000	FY 2001	Total Cost
(U) Previous President's Budget/FY 1999 PB	9,364	11,025	11,295	6,606	Cont
(U) Appropriated Value	9,922	11,025			
(U) Adjustments to Appropriated Value					
a. Congressional/General Reductions	-324	-32			
b. SBIR	-239				
c. Omnibus/Other Above Threshold Reprogrammings	-63				
d. Below Threshold Reprogrammings	-1,705				
e. Rescissions					
(U) Other Adjustments to Budget Years Since FY 1999 PB			-2,173	-1,686	
(U) Current Budget Submit/FY 2000 PB	7,591	10,993	9,122	4,920	Cont

(U) Significant Program Changes: Changes to this program since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

FY 1999: $322 identified as a source for SBIR.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603726F C3 Subsystem Integration

PROJECT: 2810

COST *($ In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
2810 Advanced Image/Information/Optical Memory Technology Applications	3,890	5,832	3,562	4,920	5,852	6,752	6,893	7,036	Continuing	Continuing

(U) A. Mission Description: This project develops and demonstrates techniques and algorithms to meet weapon systems requirements for processed and fused multi-source information needed for mission planning, navigation, targeting, and terrain analysis. It provides generic language translation processing techniques, state-of-the-art algorithms for Air Force exploitation of digitally processed image and spatial (i.e., latitude, longitude, and elevation) database products, automated capabilities to reference and display hypermedia (multi-media) information, and defensive information warfare technologies. This project also develops erasable optical data storage systems with high capacity and fast input/output speed for fighter aircraft (to provide fast airborne access to mission-oriented data and the digital terrain system) and electronic surveillance aircraft (for on-board sensor data recording, operational mission planning requirements, and large data storage requirements (i.e., high-volume, soft-copy, digital imagery exploitation)). Algorithms will be developed to automate the selection, retrieval, and downloading of information stored on mass storage devices that are distributed across the data network. An array of optical disk drives will be developed for high-throughput speed and fault-tolerant requirements. Three-dimensional (3-D) optical memory systems will be developed for volumetric digital data storage. This new mass storage technology will demonstrate ultra-high data density and fast, parallel data access within a low-cost, compact system.

(U) FY 1998 ($ in Thousands):

- (U) $3,000 Developed and demonstrated advanced imagery information, spatial data base, and information correlation technologies to enhance warfighter mission planning, navigation, targeting, and terrain analysis.
- (U) $155 Developed and demonstrated automated capabilities to collect, integrate, extract, and disseminate hypermedia (integrated text, imagery, audio, and video) information which fully exploit relationships between data available to the field commander in a timely manner.
- (U) $430 Developed and demonstrated optical, 3-D information data handling, storage, and access technologies for strategic and tactical applications.
- (U) $305 Designed, developed, and demonstrated optical disk and interface technologies that can be implemented in joint theater operations.
- (U) $3,890 Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration
	PROJECT 2810

(U) FY 1999 ($ in Thousands):

- (U) $574 Develop and demonstrate advanced imagery information, sensor fusion, and spatial database technologies to enhance warfighter mission planning, navigation, targeting, and terrain analysis.
- (U) $1,657 Design, develop, and demonstrate automated capabilities to harvest, process, disseminate, and display intelligence and sensor data to improve the sensor exploitation process.
- (U) $2,396 Continue to develop and demonstrate three-dimensional (3-D) optical information data handling, storage, and access technologies including erasable and read-only memories.
- (U) $361 Continue to design, develop, and demonstrate optical disk and interface technologies that can be implemented in joint theater operations, including a parallel Write Once Read Many Times (WORM) 3-D memory and Jukebox Redundant Array of inexpensive devices.
- (U) $673 Design, develop, and demonstrate mission planning and rehearsal capabilities for theater battle management including semi-automated, objectives-based planning and assessment for Command and Control requirements.
- (U) $171 Identified as a source for SBIR.
- (U) $5,832 Total

(U) FY 2000 ($ in Thousands):

- (U) $600 Develop and demonstrate advanced imagery and signal intelligence information, sensor fusion engine, and spatial database technologies to enhance warfighter mission planning, navigation, targeting, and terrain analysis.
- (U) $1,262 Develop and demonstrate automated capabilities to locate, retrieve, process, distribute, and display intelligence and sensor data to improve the sensor exploitation process.
- (U) $600 Initiate development of Smart Memory/Associative Recall module optical information data handling, storage, and access technologies to enable advanced fusion processing techniques.
- (U) $300 Continue to develop and demonstrate optical disk and interface technologies that can be implemented in joint theater operations, including WORM devices.
- (U) $800 Design, develop, and demonstrate mission planning and rehearsal capabilities for theater battle management, including the demonstration of software for joint Command and Control (C2) requirements.
- (U) $3,562 Total

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	PROJECT 2810

(U) FY 2001 ($ in Thousands):

- (U) $1,100 Develop and demonstrate advanced imagery and signal intelligence information, adaptive sensor fusion engine, and spatial database technologies for transition to Theater Battle Management Core Systems.
- (U) $2,076 Develop and demonstrate automated capabilities to access, extract, process, and display multi-source intelligence and sensor databases to improve the sensor exploitation process for near-real-time situational awareness.
- (U) $544 Continue to develop Smart Memory and related optical information data handling, storage, and access technologies for strategic and tactical applications. Initiate a DNA-based, four-dimensional, Petabyte memory brassboard.
- (U) $200 Design and develop optical disk and interface technologies for a three-dimensional, self-organizing storage and management system that can be implemented and tested in joint theater operations to provide information handling, fusion, exploitation, dynamic planning, and execution.
- (U) $1,000 Design, develop, and demonstrate Command and Control (C2) mission planning and rehearsal capabilities for theater battle management, including the initial demonstration of fully functional software for assessment against Air Force and joint Command and Control requirements.
- (U) $4,920 Total

(U) B. Project Change Summary - Description of Significant Changes: Changes to this program since the previous President's Budget are due to higher priorities within the S&T Program.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602702F, Command, Control, and Communications (C3).
- (U) PE 0603789F, C3 Advanced Development.
- (U) PE 0603728F, Advanced Computing Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy: Not Applicable.

(U) E. Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration PROJECT 2863

COST *($ In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
2863 Integrated Photonics	3,701	5,161	5,560	0	0	0	0	0	0	TBD

(U) A. Mission Description: Current electronic systems are susceptible to electromagnetic interference, electromagnetic pulse, and radio frequency (RF) interference. Size constraints, speed, and reliability also limit traditional electronic systems. Photonics-based systems process information in the form of light (photonic) signals and will provide major improvements in tactical and strategic Command, Control, and Communications (C3) systems by enabling small-size, high-performance, high-capacity, survivable alternatives to electronic-based systems. This project develops and demonstrates advanced hardware technology in optical processing, adaptive transmission, and nonlinear optical processing.

(U) FY 1998 ($ in Thousands):

- (U) $337 Developed and demonstrated analog and digital optical components and processing technologies to provide real-time data for pre- and post-mission analysis, as well as sensor integration and automatic target identification using multispectral surveillance systems.
- (U) $1,145 Developed and demonstrated microwave/millimeter-wave photonics components, processing and subsystems for advanced, optically-controlled radio frequency (RF) systems at increased frequencies, bandwidth, and dynamic range.
- (U) $2,219 Developed and tested high performance optical control systems for RF (super high frequency (SHF) and extremely high frequency (EHF)) phased array antennas providing extreme agility, wide angle coverage, broadband performance, and anti-jam capability.
- (U) $3,701 Total

(U) FY 1999 ($ in Thousands):

- (U) $1,405 Develop, demonstrate, and test analog and digital hardened optical component processing technologies to provide real-time data for pre- and post-mission analysis, as well as sensor integration and automatic target identification using multispectral surveillance systems (air and space).
- (U) $1,440 Develop and demonstrate microwave/millimeter-wave photonics components, processing, and subsystems for advanced, optically-controlled, reconfigurable RF systems at increased frequencies.
- (U) $2,165 Develop high performance optical control systems for RF (SHF) phased array antennas providing extremely wide angle coverage, broadband performance, and anti-jam capability for satellite communications. Start development of a True Time Delay processor.
- (U) $151 Identified as a source for SBIR.
- (U) $5,161 Total

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	PROJECT 2863

(U) FY 2000 ($ in Thousands):

– (U)	$282	Develop, integrate, demonstrate, and test analog and digital optical micro-network processing technologies and components to provide real-time data for pre- and post-mission analysis, as well as sensor integration and automatic target identification using multispectral surveillance systems for air and space platforms.
– (U)	$1,968	Develop and demonstrate microwave/millimeter-wave photonics processing and subsystems for advanced, optically-controlled, radio frequency (RF) systems at increased frequencies.
– (U)	$700	Develop high performance control systems for RF phased array antennas providing extremely wide angle coverage, broadband performance, and anti-jam capability for Global Positioning System (GPS) applications. Continue to develop a photonics True Time Delay processor. (In FY 2001, this effort will be conducted in Project 69CK, PE 0603203F.)
– (U)	$2,610	Complete development and demonstration of three-dimensional optical information data handling, storage, and access technologies including erasable and read-only memories.
– (U)	$5,560	Total

(U) FY 2001: Not Applicable.

B. Project Change Summary - Description of Significant Changes: Changes to this program since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

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(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602702F, Command, Control, and Communications (C3).
- (U) PE 0603789F, C3 Advanced Development.
- (U) PE 0603728F, Advanced Computing Technology.
- (U) PE 0603203F, Advanced Aerospace Sensors.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy: Not Applicable.

(U) E. Schedule Profile: Not Applicable.